

Homeowners Benefits To Ducts In Conditioned Space

Brochure to Educate Consumers about the Benefits of
Ducts in Conditioned Space (product 6.4.2d)

TECHNICAL REPORT

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PREFACE

The Public Interest Energy Research (PIER) Program supports public interest energy research and development that will help improve the quality of life in California by bringing environmentally safe, affordable, and reliable energy services and products to the marketplace.

This document is one of 33 technical attachments to the final report of a larger research effort called *Integrated Energy Systems: Productivity and Building Science Program* (Program) as part of the PIER Program funded by the California Energy Commission (Commission) and managed by the New Buildings Institute.

As the name suggests, it is not individual building components, equipment, or materials that optimize energy efficiency. Instead, energy efficiency is improved through the integrated design, construction, and operation of building systems. The *Integrated Energy Systems: Productivity and Building Science Program* research addressed six areas:

- Productivity and Interior Environments
- Integrated Design of Large Commercial HVAC Systems
- Integrated Design of Small Commercial HVAC Systems
- Integrated Design of Commercial Building Ceiling Systems
- Integrated Design of Residential Ducting & Air Flow Systems
- Outdoor Lighting Baseline Assessment

The Program's final report (Commission publication #P500-03-082) and its attachments are intended to provide a complete record of the objectives, methods, findings and accomplishments of the *Integrated Energy Systems: Productivity and Building Science Program*. The final report and attachments are highly applicable to architects, designers, contractors, building owners and operators, manufacturers, researchers, and the energy efficiency community.

This attachment, "Brochure to Educate Consumers about the Benefits of Ducts in Conditioned Space" (Attachment A-17) provides supplemental information to the program's final report within the **Integrated Design of Residential Ducting & Air Flow Systems** research area.

The Buildings Program Area within the Public Interest Energy Research (PIER) Program produced these documents as part of a multi-project programmatic contract (#400-99-413). The Buildings Program includes new and existing buildings in both the residential and the non-residential sectors. The program seeks to decrease building energy use through research that will develop or improve energy efficient technologies, strategies, tools, and building performance evaluation methods.

For other reports produced within this contract or to obtain more information on the PIER Program, please visit www.energy.ca.gov/pier/buildings or contact the Commission's Publications Unit at 916-654-5200. All reports, guidelines and attachments are also publicly available at www.newbuildings.org/pier.

ABSTRACT

The “Brochure to Educate Consumers about the Benefits of Ducts in Conditioned Space” was produced as part of the Integrated Design of Residential Ducting & Air Flow Systems project. This was one of six research projects within the *Integrated Energy Systems: Productivity and Building Science* Program, funded by the California Energy Commission’s Public Interest Energy Research (PIER) Program.

This brochure is an attachment to the program’s final report (Commission publication #P500-03-082), and a supplement to the “Homebuilders Guide to Ducts in Conditioned Space,” which was produced as part of this research project.

Traditionally, California houses have the furnace or air handler and the ductwork located in the attic. The resulting air leaks, reduced air flow, and increased infiltration can lead to significant energy losses and comfort problems. This research project identified energy-efficient options for building homes with ducts in conditioned space while also maximizing usable floor area, minimizing energy and construction costs, and simplifying the construction process.

This brochure will help consumers understand the benefits of locating ducts in conditioned space. Instead of having the ducts in the attic, exposed to extreme temperatures, the design of the house is altered slightly so the ducts are built in a space that is close to the inside space temperature. This can be done by insulating the attic, installing the ducts in a dropped ceiling in hallways and closets, or by modifying the framing to provide an insulated duct space inside the attic. These modifications can save 8% to 15% on annual cooling electricity costs.

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Key words: duct, conditioned space, unconditioned space, air handler, ductwork, attic, energy saving, electricity saving, air leak, infiltration, energy efficient home

THE PROBLEM WITH DUCTS IN THE ATTIC

New houses have become more energy efficient. Increased insulation, improved windows, reduced air loss and more efficient air conditioners and appliances mean lower energy bills and greater comfort.

But new houses could be more energy efficient still. In most new California houses the furnace or air handler and ductwork are located in the attic. (An *air handler* circulates conditioned air through the ducts.) With the summer sun beating down, the attic can get very hot—up to 40°F warmer than the air outside.



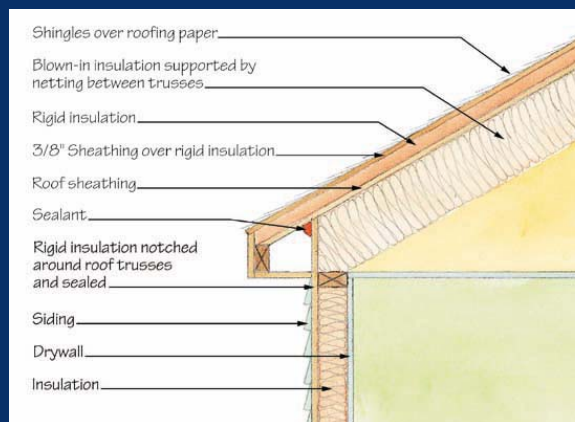
When ducts are located in a hot attic, the cool air inside them warms up before it reaches the rooms you want to air condition. Air leaks are also inevitable. When cool air leaks from a duct into a hot attic, more energy and money are expended to keep a home comfortable.

How to prevent this? California's energy code allows an option for sealed ducts in new homes. But sealed ducts energy losses are still ~6% so it's important to keep the ducts out of hot, unconditioned space—by keeping the attic cooler with insulation just below the roof deck, or by moving the ducts to another location.

ARE YOU IN THE MARKET FOR A BRAND-NEW HOME?

MAKE SURE YOUR BUILDER READS BUILDING HOMES WITH DUCTS IN CONDITIONED SPACE—A GUIDE FOR BUILDERS. THIS NEW PUBLICATION DESCRIBES TECHNIQUES FOR CONSTRUCTING ENERGY-EFFICIENT HOMES WITH DUCTS IN CONDITIONED SPACE.

THE GUIDE PRESENTS THREE DESIGN APPROACHES—DROPPED CEILING, CATHEDRALIZED ATTIC, AND PLENUM TRUSS—FOR ONE- AND TWO-STORY DETACHED HOUSES AND TOWNHOUSES. IT PROVIDES DIAGRAMS, DETAILED DESCRIPTIONS AND COST INFORMATION TO HELP BUILDERS MODIFY THEIR HOME DESIGNS TO INCORPORATE DUCTS IN CONDITIONED SPACE.



Detail of Cathedralized Attic approach

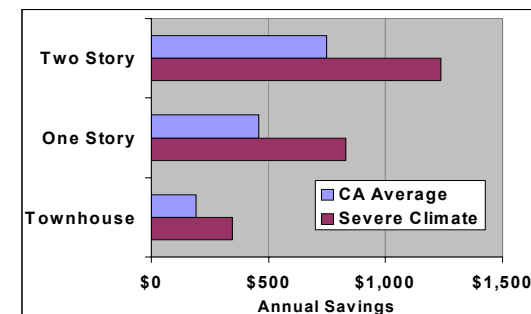
BENEFITS OF DUCTS IN CONDITIONED SPACE

Want to save 8% to 15% on your annual air conditioning costs? Here's how: Build your new house with the air-conditioning ducts located within the conditioned space. (*Conditioned space* refers to rooms and other spaces that are within a home's insulated shell.) Instead of running ducts through an unconditioned attic, a house design can be altered slightly so the ducts aren't exposed to extreme temperatures.

This can be done by insulating the attic immediately below the roof deck, installing the ducts in a dropped ceiling above hallways and closets, or modifying the framing to provide an insulated duct space inside the attic. The best choice depends on your climate and your home's design.

More good news: Building homes with ducts in conditioned space saves money. In some cases, construction costs may increase by up to \$1,000, but this will be recouped within seven years or less thanks to lower utility bills. In other cases, building a house with ducts in conditioned space may actually reduce construction costs.

Annual energy savings will depend on your climate and house size and design. The chart below gives some savings estimates for two California climate conditions.



INTERESTED?

Talk to your builder about building your new house with ducts *inside* the conditioned space. The environment and your wallet will thank you!

A new publication is available to assist builders: *Building Homes with Ducts in Conditioned Space—A Guide for Builders*. It provides valuable information about designing and building homes that save energy and increase comfort.

The *Guide for Builders* was created to address the questions of residential building contractors, subcontractors, developers, and architects. It includes construction drawings and descriptions of each recommended approach, organized by building component.

Additional related publications are available for energy and building code officials and other people interested in creating comfortable homes and lowering utility bills by locating ducts in conditioned space. These include reports on:

- Costs and Energy Savings
- Market Barriers
- Technical Information for Code Officials

This brochure and the *Guide for Builders* were developed as part of the *Integrated Energy Systems: Productivity and Building Science* program. To learn more, visit www.newbuildings.org/pier.



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Your local utility company may have programs to help.

Download the *Guide for Builders*
and other publications from
www.newbuildings.org/pier or
www.energy.ca.gov/pier



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GARDAnalytics
Energy, Economic and Environmental Research

**WHY PUT AIR
CONDITIONING
DUCTS IN A
HOT ATTIC?

THERE MUST
BE A BETTER
WAY...**



**HOMEOWNERS
INFORMATION ON
DUCT LOCATION**

